

# Understanding the Human Factors behind Medication Adherence in Lifestyle Diseases: A Focus on Family, Knowledge, and Control

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## ABSTRACT

To treat successfully lifestyle diseases such as diabetes and hypertension, adherence to medication is the key. Yet a series of factors contributes to less-than-ideal adherence. Among these, health literacy, patient empowerment, and family history stand out. Even though it can sometimes lead to fatalism, a positive family history can raise awareness and perceived risk, which often motivates individuals to adhere more strictly to advised therapies. Patients with health literacy are more competent in understanding medical information, effectively managing medications, and making informed choices; poor compliance is consistently linked with lower literacy rates. Empowerment of patients, such as self-efficacy, active participation, and an element of control over healthcare, has been shown to increase compliance and enhance disease outcomes. Enhancing long-term treatment outcomes in individuals with lifestyle-related diseases involves addressing these factors through patient-focused interventions.

**Keywords:** Diabetes mellitus, Hypertension

## I. INTRODUCTION

Non-adherence to drugs is also termed as non-adherence to medication, and it may involve premature discontinuation of treatment, poor use, or failure to initiate. Patients with chronic conditions often fail to adhere to drugs; in industrialized countries, average prevalence is estimated at around 50%. Non-adherence adds to the poorly efficient existing health systems by leading to poor health outcomes, rising morbidity and mortality, as well as a massive healthcare cost in addition to what has been incurred. Among the most prevalent chronic diseases in the world are hypertension and diabetes. Diabetes continues to exert a clinical and economic burden on patients and society in general despite improved treatment. A variety of studies have, however, reported poor compliance rates among diabetic patients, even though appropriate compliance with medication is known to improve glycemic control in the disorder.

In addition, a majority of patients with hypertension fail to achieve and maintain good control of blood pressure, even though it is necessary in order to reduce cardiovascular risk. To this extent, it is well established that the most fundamental reason for failure of treatment in hypertension is lack of compliance with antihypertensive medications. Furthermore, hyperlipidemia is a principal risk factor for the development of cardiovascular conditions and is the cause of more than 2.6 million deaths annually. Again, despite the benefits of antihyperlipidemic agents, adherence to statin therapy remains a challenge worldwide.

This review synthesizes findings from cross-sectional studies that examine how **family history**, **health literacy**, and **patient empowerment** impact medication adherence in individuals with lifestyle-related diseases.<sup>(5)</sup>

## MEDICATION ADHERENCE IN LIFESTYLE DISEASES

### ADHERENCE CHALLENGES IN DIABETES

More than 400 million individuals globally live with type 2 diabetes mellitus (T2DM), a prevalent chronic disease that is determined by environmental as well as genetic factors. Insulin resistance and  $\beta$ -cell dysfunction are components of pathophysiology, and these are mediated by oxidative stress, mitochondrial dysfunction, and  $\beta$ -cell dedifferentiation. Treatment should be based on non-pharmacological therapy. Normal glycemia should be ensured through strategies such as dietary modification, cognitive-behavioral treatment, and augmented physical exercise. Advanced therapies, including SGLT2 inhibitors and GLP-1 receptor agonists, complement these treatments and offer solid glycemic control, weight control, and reduced cardiovascular risk. Complications of T2DM, such as diabetic kidney disease, retinopathy, and neuropathy, underscore the need for early diagnosis and comprehensive management to improve patient outcomes and quality of life.<sup>(1)</sup>

## **FAMILY HISTORY RELATED CHALLENGES**

An important genetic risk factor that encompasses both genetic and environmental factors contributing to the risk for type 2 diabetes is family history (FH) of diabetes. In the clinical setting, it can be used as a measure that partially captures an individual's genetic predisposition to type 2 diabetes and is easily assessed as part of the medical history. People with a first-degree family history of type 2 diabetes are at greater risk of developing the condition compared to individuals with no history of the disease. They have lower insulin sensitivity and lower basal energy expenditure even before symptoms appear in clinical diabetes. It has been suggested that there is a strong genetic factor to a family history of type 2 diabetes. Some linkage and familial aggregation studies showed evidence for genetic susceptibility to diabetes and attendant complications. Vascular issues, based on this information, can be affected by hereditary factors. Based on genome-wide association studies, some genetic alterations can be responsible for inter-individual variability in the susceptibility to developing complications of diabetes. While specific genes or loci are not directly associated with diabetic vascular complications, several clinical and epidemiologic investigations have demonstrated that the pathogenesis of diabetic vascular complications has both genetic as well as environmental determinants. Familial clustering of diabetic issues can result from shared genes, shared environmental factors, or both. However, very little is understood regarding the exact composition of these two main etiological factors and the pathogenic mechanisms that lead to them. Growing awareness regarding predictive factors of diabetic complications makes that they will be preventable in diabetic patients. Early detection of risk factors can minimize the development and progression of diabetic microvascular complications, and enhance patients' quality of life.<sup>(14)</sup>

One of the best indicators of the combined effect of familial inherited genetic susceptibility and shared environments/behaviors is family history. Due to these concepts, physicians are increasingly employing family medical histories to calculate a patient's risk of acquiring complicated diseases such as heart disease and type 2 diabetes. In high-risk populations, even a simple self-reported family health history has been an extremely useful and rather consistent tool for helping to interpret other genetic and genomic information and for tailoring prevention

regimens. To encourage more active collection of family health history, there is a continuous interest in developing electronic platforms, educational programs, and public health interventions. These strategies are anticipated to facilitate the collection of more accurate information for clinical practice that will ultimately result in improved health care and population health outcomes.<sup>(11)</sup>

## **HEALTH LITERACY**

Diabetes is a prevailing chronic disorder, which can cause "long-term damage, dysfunction, and failure of various organs, particularly the eyes, kidneys, nerves, heart, and blood vessels". One In 2015, the disease had a global prevalence of 8.8% and is anticipated to increase to 10.4% by 2040, a hefty increase in self-care expense. 3 Patients with diabetes have to manage the disease actively in their daily lives. This is why being able to properly utilize health information and healthcare services is of utmost significance. Thus, effective self-management is highly correlated with health literacy, i.e., "the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions."<sup>(9)</sup>

Poor health literacy is independently associated with poorer glycemic control and higher rates of retinopathy among primary care patients with type 2 diabetes. The overrepresentation of diabetes complications in underprivileged populations may be compounded by low health literacy. Interventions should be developed and evaluated with a focus on enhancing diabetes outcomes among individuals with poor health literacy. A set of skills termed health literacy encompasses the ability to perform the basic reading and arithmetic functions required to function in a clinical environment. Individuals at low levels of health literacy are having trouble with anything from reading appointment reminders, instructional pamphlets, or informed-consent forms to reading labels on medicine bottles and interpreting blood glucose readings or medication dosages. Aside from their reading difficulties, patients with low health literacy can also have difficulty with understanding risk and following verbal instructions. Low health literacy could be an especially formidable barrier to chronic-disease care in a health care system when heightened technical and self-management expectations are imposed on patients by marketplace pressures and advances in science.<sup>(15)</sup>

With patient empowerment, education, and telemonitoring, the advent of digital health

technologies holds the promise of enhanced DM care. A text-messaging-based diabetes education program improved glycemic control over a six-month time period, as per a prior study. Moreover, compared with usual care that typically involves customary face-to-face visits and traditional therapy without digital intervention, telemedicine enhanced glycemic control among patients with diabetes mellitus, based on a metaanalysis of randomized trials. These findings underscore the potential benefits of digital health therapies for diabetes management that makes it an appropriate area to explore. Nevertheless, being able to use these technologies properly rests on one's electronic health literacy, which has been termed as being "able to seek, find, understand, and appraise health information from electronic sources and apply the knowledge gained to addressing or solving a health problem.

Social determinants of health (SDOH), such as socioeconomic status, education, and language ability, have been linked to the health outcomes and ability to access healthcare services of an individual

### PATIENT EMPOWERMENT

Involvement of patients and their family in care is the foundation of DM management and the professional role of healthcare providers is to prompt and encourage patients' self-management. Support of self-management education in form of problem-solving and shared decision-making skills development is an ongoing process for patients with DM. Even though, empowerment programmes need to be tailored to the characteristics of patients and healthcare providers need to have the ability to tailor their interventions according to the profile of the patient. Communication between the patient and the healthcare professional is one of the most significant variables affecting the clinical results and self-management of individuals with diabetes mellitus. Interpersonal components of communication in DM care, like participation in goal-setting and decision-making, can influence how the person with DM interacts with and participates in their care. Communication involves more than just passing down knowledge or skills. 38 A cross-sectional study on people with DM found a significant correlation between poor communication and non-adherence to medication, especially oral hypoglycaemic medications. When developing interventions to improve self-management behaviors and lower HbA1c levels in

people with diabetes mellitus, increasing self-efficacy is essential.<sup>(2)</sup>

A major public health concern that is increasingly prevalent is diabetes mellitus (DM). The IDF Diabetes Atlas estimated that in 2021, 536.6 million people aged between 20 and 79 had diabetes, and by 2045, the number is likely to rise to 783.2 million. Ninety to ninety-five percent of all diagnosed cases of diabetes mellitus are Type 2 Diabetes Mellitus (T2DM). The health of patients, health-related quality of life (HRQOL), and socioeconomic issues are all severely affected by type 2 diabetes (5,6). Tailored and intricate treatment plans, including lifestyle changes, can enhance disease control to postpone clinical complications and death, despite the fact that type 2 diabetes cannot be cured. Self-care behavior adherence is challenging, yet essential to accomplish maintained long-term control and enhance health outcomes. Psychological and psychosocial problems have been reported as widespread self-care obstacles among patients with type 2 diabetes. To begin with, it has been conceived both as a process and an outcome. It can be conceived as the process through which patients assume control over their health care, and patient-centeredness facilitates that. Consistently, patient empowerment has been conceived as a meta-paradigm which integrates patient participation and patient centeredness. From such an angle, participation of the patient can be seen as a prerequisite to attain PCC, which further fosters patient empowerment. Additionally, it can also be viewed as a consequence because patients become empowered when they possess the requisite knowledge and competencies to shape their own behavior for better QoL. Second, most definitions of patient empowerment refer to other theoretically related concepts such as perceived control, patient activation, and self-efficacy. While empowerment is an overarching concept, assisting patients to take more responsibility for their own health is at the core of it. Patient empowerment is therefore a more extensive and multidimensional concept but there is no generally accepted tool that can be used to quantify it.<sup>(4)</sup>

### HYPERTENSION

Hypertension is a cardiovascular disease defined by an elevated systemic blood pressure. This devastating disease afflicts 30-40% of the adult population worldwide. The disease burden for hypertension is great, and it greatly increases the risk of cardiovascular morbidity and mortality. Unfortunately, there are a myriad of factors that

result in an elevated blood pressure. These include genetic factors, a sedentary lifestyle, obesity, salt intake, aging, and stress. Although lifestyle modifications have had limited success, anti-hypertensive drugs have been moderately effective in lowering blood pressure. New approaches to control and treat hypertension include digital health tools and compounds that activate the angiotensin receptor type 2 (AT2), which can promote cardiovascular health. Nonetheless, research on hypertension and its management is vital for lessening the significant health and economic burden of this condition.<sup>(3)</sup>

### ADHERENCE CHALLENGES IN HYPERTENSION FAMILY HISTORY RELATED CHALLENGES

A major non-modifiable risk factor for hypertension is family history. Many family studies that demonstrate blood pressure correlations among parents and offspring as well as among siblings have attested to the genetic basis of hypertension. Genetic factors explain approximately 30% of the variance in blood pressure, with findings varying between 25% in pedigree studies and 65% in twin studies. Augmented renal proximal sodium reabsorption, genetic traits that predispose to high blood pressure, including elevated sodium-lithium counter-transport, reduced urinary kallikrein excretion, increased uric acid level, elevated fasting plasma insulin levels, high-density LDL sub-fractions, fat pattern index, oxidative stress, and body mass index, as well as shared environmental risk factors such as sodium intake and heavy metal exposure are some of the pathways implicated to explain the correlation between hypertension and positive family history of hypertension.<sup>(13)</sup>

The influencing factors of the incidence of hypertension are congenital factors and natural factors, congenital factors are hereditary factors like genes or family history, acquired factors are primarily bad living habits, overweight / obesity, etc. Body mass index was an integral index of the result of acquired lifestyle, and closely associated with the incidence of hypertension. Hereditary history of hypertension was a significant indicator of genetic factors, it was often utilized as a surrogate indicator to research the interaction between genetic factors and diseases. Hypertension was among the frequent complications in diabetes; the prevalence of hypertension among local patients with diabetes who had hypertension was 20–30%. The odds ratio

for the interaction between hypertension and diabetes and family history was 16.537. It was proven that DM and FH are positively interacted with hypertension. When both exposed to family history and diabetes risk factors, the proportion of the interaction between the pure factors (PAP) was 55.86%, which indicates that the interaction of the factors was accountable for 55.86% of the hypertension. Hyperglycemia can increase blood volume, overwork the kidneys, cause water and sodium retention, and eventually raise blood pressure because the disruption of glucose metabolism might accelerate the hardening of the renal artery and systemic arteriole and elevate peripheral resistance and blood pressure. Peripheral resistance and cardiac output were associated with the increase in blood pressure. Elevated cardiac output without peripheral alteration may lead to a rise in blood pressure; also, elevated peripheral resistance without alterations in cardiac output or blood volume may lead to an increase in blood pressure. Both these alterations in diabetic patients led to a steep rise in blood pressure and severe complications. One of the risk factors for hypertension was alcohol intake. A small quantity of alcohol over a long period of time might increase blood pressure; in hypertensive individuals, it might increase heart rate, cardiac load, and blood pressure. The outcome of the logistic regression analysis in this research showed that alcohol consumption was a risk factor for hypertension; the OR of the drinking habit was 1.391. Drinking habits and genetic predisposition to hypertension interacted negatively on hypertension. A small amount of alcohol can provide vascular protection, and this could be due to intermittent drinking habit interference.<sup>(6)</sup>

### HEALTH LITERACY

In most countries, hypertension is an important risk factor for renal failure, heart failure, stroke, and atherosclerosis. Once hypertension has developed, it becomes especially necessary to control it, so that complications can be kept to a minimum through control of the blood pressure. Proper treatment and disease control is a major issue with patients as well as with physicians. Such inappropriate treatment may not only cause non-response to medication therapy, but also influence subsequent follow-ups and adherence to recommendations for lifestyle adjustments. In fact, patients' knowledge is an important factor in response to treatment and control of these diseases. Health literacy involves a set of skills such as reading, listening, analysis, and decision-making,

and ability to apply these skills to health-related situations, and does not necessarily imply level of education or general reading ability. Various studies have demonstrated that poor health literacy leads to delay in diagnosis, self-care incapability, further use of emergency services, prolonged hospital stay, increased incidence of diseases, and eventually increased mortality rate.<sup>(12)</sup>

Excessive salt intake is the main contributing factor towards hypertension, with strokes accounting for 62% and coronary heart disease for 49%. According to the WHO, the most cost-effective public health strategy to lower NCDs includes salt reduction. In addition, it is one of the top three priorities for addressing the worldwide NCD crisis. Blood pressure can be lowered by reducing salt consumption among hypertensive and normotensive people, and it works in conjunction with antihypertensive medications. Evidence has shown that the risk of CVD and death can be minimized by lowering salt consumption. Looking at the current trends, health literacy research is scarce. Health literacy is defined as the ability to access, understand, appraise, and apply health information in everyday life to make judgments and decisions about healthcare, disease prevention, and health promotion to maintain or improve one's quality of life over time. The concept of health literacy has risen in importance over the last two decades as a result of its numerous benefits to individuals, public health, and the healthcare system as a whole and was even considered as one of the crucial determinants of health.<sup>(8)</sup>

#### PATIENT EMPOWERMENT

Self-management behaviors essentially capture six domains: management of medications, monitoring of condition, management of diet, management of sports, management of work and rest, and emotional management. Self-management behavior can be crucial in helping patients reduce their blood pressure, as a number of studies have shown. HTN management involves a life-long regimen consisting of lifestyle changes including weight reduction, smoking cessation after a heart-healthy diet, and greater physical activity. Compared to conventional methods, these empowerment strategies have been proven to enhance HTN patients' capacity in achieving and maintaining healthy behaviours. They are also effective in reducing blood pressure, which can reduce re-hospitalisation rates and medical costs.

As an active partner, the patient might take rational everyday decisions regarding his/her disease status and self-manage the disease in order

to ensure healthy behavior.. Active communication between patients and healthcare organizations facilitates the identification of patients' needs and expectations, and healthy behavior among patients with chronic diseases reduces the financial cost for the healthcare industry.<sup>(7)</sup>

#### II. CONCLUSION

Improving medication adherence in diabetes and hypertension depends on addressing key influencing factors such as family history, health literacy, and patient empowerment. Enhancing patients' understanding of their condition, fostering active involvement in care, and using family health awareness as a motivational tool can significantly improve adherence and support better long-term health outcomes.

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